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14. ABSTRACT

The advent of weapon systems designed to contest operational access to joint forces have given many countries low-cost options to prevent intrusion into their surrounding domains. In recognizing the threat these weapons present to US forces, the Joint Chiefs developed the Joint Operational Access Concept. The first subset to this was Air-Sea Battle, a joint concept for the use of air and naval assets to defeat a complex A2/AD system that largely left out the land component forces. In following the original intent of JOAC, this paper considers the benefits of employing the cross-domain capabilities of US Army and USMC Artillery and Air Defense Artillery assets to counter an anti-access threat, while reproducing the same capability for the benefit of the joint force. It explains the strategic benefits artillery assets provide to joint force commanders as a rapidly deployable, flexible deterrent option and the operational benefits to the maritime component commander in the fight for sea control. Finally, it makes recommendations to the joint force on integrating functions and developing future capabilities to effectively employ these assets in a role supporting the maritime component.

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Cross-Domain Synergy: Using Artillery in the Fight for Sea Control

by

Steven Huckleberry

Major, US Army

A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Maritime Advanced Warfare School.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

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28 April 2017

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Paper Abstract

The advent of weapon systems designed to contest operational access to joint forces have given many countries low-cost options to prevent intrusion into their surrounding domains. In recognizing the threat these weapons present to US forces, the Joint Chiefs developed the Joint Operational Access Concept. The first subset to this was Air-Sea Battle, a joint concept for the use of air and naval assets to defeat a complex A2/AD system that largely left out the land component forces. In following the original intent of JOAC, this paper considers the benefits of employing the cross-domain capabilities of US Army and USMC Artillery and Air Defense Artillery assets to counter an anti-access threat, while reproducing the same capability for the benefit of the joint force. It explains the strategic benefits artillery assets provide to joint force commanders as a rapidly deployable, flexible deterrent option and the operational benefits to the maritime component commander in the fight for sea control. Finally, it makes recommendations to the joint force on integrating functions and developing future capabilities to employ these assets effectively in a role supporting the maritime component.

The concept of anti-access is not new. The Great Wall of China and Athenian walls demonstrate this strategy has existed for centuries. More contemporary illustrations are the Japanese perimeter defense strategy during WWII and Iraq's integrated air defense system, KARI, during the Gulf War. In both cases, invading forces used complementary capabilities in a strategy to reduce the threat and penetrate their defenses.

Since the Gulf War, several nations have developed their own strategies to prohibit access and deny militaries freedom of action in their region. Termed anti-access and area denial (A2/AD), these strategies are enabled by advanced weapons to serve as a low-cost deterrent, allowing adversaries to pose a high cost on intervening military forces.[1] More importantly, the relatively inexpensive nature of these systems allow many countries to isolate their region from outside influences, creating economic instability and eroding confidence in the international order.

The international order depends on the stability and economic vitality granted by the free access to the global commons. The most important of these commons continues to be the maritime domain. With over 90% of the world's trade transported over the oceans, its unrestricted use is essential to the global economy.[2] Since WWII the US Navy (USN) has protected access to this domain. With a robust trade economy and bordering two oceans, it serves US interests to maintain freedom of navigation.[3] However, preserving access under the threat of advanced A2/AD systems poses a risky and daunting challenge to the USN. Addressing this threat requires a new approach to maintaining freedom of action within the vital maritime

[1]The JOAC defines *Anti-access* as those actions and capabilities, usually long-range, designed to prevent an opposing force from entering an operational area. *Area denial* is defined as those actions and capabilities, usually of shorter range, designed not to keep an opposing force out, but to limit its freedom of action within the operational area.
[2] Joint Chiefs, *Cross-Domain Synergy in Joint Operations*, 43.
[3] U.S. President, *The National Security Strategy*, 13.

domain. One such approach is using the cross-domain potential of land-based fires. Integrating US Army and Marine Corps (USMC) artillery capabilities into operations pursuing sea control increases the ability of the joint force to deter and defeat adversaries posing an A2/AD threat.[4]

This essay intends to show that US Army and USMC artillery assets, to include Air Defense Artillery (ADA), should be implemented into the Joint Maritime Component Commander's (JFMCC) fight for sea control. The findings of several research organizations and discussions by leaders at the Association of the US Army in October 2016 reinforce this idea.[5] It will present this argument by first, describing the complementary capabilities artillery units can provide the joint force in seeking to establish sea control. Second, it will outline different employment concepts to support the JFMCC. Third, it will highlight supporting joint functions to facilitate the implementation of these concepts. Finally, it will address the counterarguments presented against using land-based artillery in support of sea control and present recommendations to the joint force in advancing the application of this proposal.

In proposing this thesis three assumptions were made. First, the Army and Marines would field a long-range anti-ship missile for their organic M270A1 Multiple Launch Rocket System (MLRS) and M142 High Mobility Artillery Rocket System (HIMARS). Former Defense Secretary Ash Carter announced the intention to develop this capability.[6] With these systems already possessed by the US Army, USMC, and 14 allied countries, it suits General Mark Milley's, US Army Chief of Staff, cost effective method of improving existing platforms and

[4] *A Cooperative Strategy for 21st Century Seapower* defines sea control as "allowing naval forces to establish local maritime superiority while denying an adversary that same ability." Maritime Superiority is defined by the *DOD Dictionary of Military Terms* as "That degree of dominance of one force over another that permits the conduct of maritime operations by the former and its related land, sea, and air forces at a given time and place without prohibitive interference by the opposing force."
[5] Urness, "Milley Addresses Attendees of AUSA Meeting," 4.
[6] Freedberg, "Carter, Roper Unveil Army's New Ship-Killer Missile."

maximizing interoperability within the joint force and allies abroad.[7] The second assumption is that the anti-ship missile would meet or exceed the range of the Army Tactical Missile System (ATACMS) projectile. This missile can range 300km (162nm). The Strategic Capabilities Office and Lockheed Martin have designed a version of the ATACMS with a seeker capable for use against ships.[8] The third assumption is the fielding of anti-cruise missile capabilities developed for short-range ADA formations.[9]

DEVELOPMENT OF JOAC AND THE ARMY'S INCLUSION

"The experience of the Great Patriotic War showed that the success of the actions of land forces and the capture by them of new coastal areas also help to gain dominance at sea."
-Commander-in-Chief of the Soviet Navy, Admiral S.G. Gorshkov, *The Sea Power of the State*

The proliferation of systems designed to deny operational access to strategic areas around the globe presented a challenge to US leaders seeking to maintain the current international order and its economic benefits. The Joint Chiefs' solution, the Joint Operational Access Concept (JOAC), proscribes using cross-domain synergy to leverage each service's strengths against an opponent's vulnerability to establish superiority in a domain.[10] The first subset of JOAC was Air-Sea Battle (ASB). It envisioned integrating complementary and redundant capabilities to enable the joint force to defeat A2/AD systems, establish local superiority, and project forces into an operational area.[11] It fell short of the JOAC's goals by limiting focus on defeating an adversary's A2/AD network, primarily from the two domains corresponding with its name.[12]

ASB presented three issues to national leaders. First, it primarily focuses on disrupting, destroying, and defeating an adversary's A2/AD system to allow US forces freedom of

[7] Lockheed Martin, Multiple Launch Rocket System M270; Maze, "Radical Change is Coming."
[8] Freedberg, "Army Races to Rebuild Short-Range Air Defense."
[9] Ibid.
[10] Joint Chiefs, *Joint Operational Access Concept*, 14.
[11] Ibid., 4.
[12] Hutchens, "Joint Concept for Access and Maneuver," 136.

maneuver.[13] However, with technology enabling the rapid development of offensive capabilities, rivals can produce new weapons faster than the US can create defenses against them. Moreover, the cost of developing defensive weapons is greater than those of offense and does not negate the threat of munitions oversaturating and exhausting defenses.[14] Secondly, ASB hinders the nation's principle of acting in an allied effort.[15] Its concept of systemically defeating an A2/AD network precludes many potential allies from participating because it necessitates expensive platforms capable of operating in these environments. Unilateral actions prevent the US from benefiting from partner capabilities and sharing the burdens of conflict. Lastly, it requires forces to strike targets located within the opponent's country and, therefore, has the potential strategic implication to escalate the level of conflict.[16]

With the cost and risk of executing ASB high, the Joint Chiefs turned to a new idea, Joint Concept for Access and Maneuver in the Global Commons (JAM-GC). The new operational concept was not developed to combat an adversary's A2/AD system or advocate for specific emerging technologies, but to consider an operational approach that would defeat an opponent's plan and intent.[17] Its focus on identifying joint force capabilities to defeat evolving threats provides the US Army and USMC an opportunity to leverage their capacity in controlling freedom of maneuver within the global commons. By introducing ground forces with capabilities to destroy ships and defend against aerial threats, the Joint Force Commander (JFC) can gain an advantage by changing the nature of the problem our adversaries face.

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[13] Hutchens, "Joint Concept for Access and Maneuver in the Global Commons," 136.
[14] Stashwick, "Signs of Diminishing Returns."
[15] U.S. President, *The National Security Strategy*, 3.
[16] Biddle, "Future Warfare in the Western Pacific," 9.
[17] Hutchens, "Joint Concept for Access and Maneuver," 136.

ARTILLERY'S CONTRIBUTION

"One gun on land is equal to three on the water."
-Admiral D.D. Porter at the Battle of Fort Henry, American Civil War

Using the concept of cross-domain synergy, land forces can counter adversaries' efforts to deny sea control. Long-range artillery systems equipped with anti-ship missiles paired with air defense artillery can quickly deploy to strategic locations, thereby denying an adversary's freedom of action and sanctuary within its own A2/AD system. Additionally, by conducting these operations in support of the JFMCC, and in coordination with other services, these efforts can assist the joint force in establishing the local maritime superiority necessary to obtain freedom of maneuver. Artillery maximizes the joint force's strengths of distributed firepower, persistence, and resilience as outlined by the precepts to establish operational access.[18]

By employing artillery batteries in key littoral areas, US forces can provide distributive firepower and increase the complexity of an opponent's problem.[19] Mobile, ground-based launchers' ability to concentrate their fires from across time and space present challenging targets for enemy forces to combat.[20] By their very nature, artillery units operate in dispersed formations with considerable mobility and concealment. Their ability to disperse formations in concealed, hardened positions make them more difficult for adversaries to locate and neutralize. Their mobility makes the information perishable. The time an opponent has to acquire a firing battery, target it, and hit it is fleeting. Unlike ships that are limited in their capacity to move and hide from counterfire, "shoot and scoot" is an artillery unit's best method of survival.[21] Furthermore, in keeping with the USN's concept of distributed lethality, artillery units will add

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[18] Joint Chiefs, *Joint Operational Access Concept*, 30; Lindsey, "Beyond Coast Artillery," 4.
[19] An artillery battery is a unit of guns, rockets, or missiles so grouped to facilitate better battlefield communication and command and control. Distributive is defined as the ability to disperse, reposition, and use a variety of bases and operating locations, while retaining the ability to maneuver and concentrate combat power; Hutchens, "Joint Concept for Access and Maneuver in the Global Commons," 137.
[20] Biddle, "Future Warfare in the Western Pacific," 12.
[21] Gunzinger, "Outside-In," 65.

more platforms to maximize offensive firepower and tax an adversary's resources.[22] Increasing the number of platforms confronting adversaries compels opponents to expend resources to locate them and prevents them from massing forces in areas where artillery is present.

US Army and Marines provide the JFC with the advantage of a persistent force. Artillery requires significantly less logistical support and infrastructure than air or naval assets with similar offensive firepower. Designed to work in modular formations, forces can be arrayed to meet the needs of the mission and deployed with a tailored sustainment package. These modular elements can remain in austere environments for extended periods of time. This grants them the capability to deploy to regions with little infrastructure and maintain a persistent, forward-deployed threat to potential adversaries navigating in nearby littorals. Thus the JFC has viable solutions to present a credible, persistent force despite the geographic and infrastructure problems associated with forcible entry operations.[23]

US Army and USMC persistence are supplemented by the number of partners they possess. Stationed in 70 countries and at 800 bases across the world, the US military has many partners it can depend on.[24] The Army especially prospers in this regard because many nations are unable to afford the exceptional cost of air and naval forces, but have an army for self-defense.[25] By leveraging these partners, US Army elements can establish a presence within any region in the world. Additionally, this contains a secondary, strategic implication; from the opponent's perspective, an attack within the borders of another sovereign nation, as opposed to in international waters or air, has greater consequences and can potentially serve as a more effective deterrent by removing the ambiguity of contested maritime space. If an attack was to

[22] Rowden, "Distributed Lethality."
[23] Joint Chiefs, *Joint Concept for Entry Operations*, 8.
[24] Vine, "Where in the World is the US Military?"
[25] Gordon, "The Army's Role in Overcoming Anti-Access and Area Denial Challenges," 22.

occur, it can generate more support for entry operations and increase condemnation against an adversary.[26]

Artillery's capabilities can serve in several roles that complement other services, providing resilience to the fight for sea control. By introducing artillery units to the maritime fight, the US military provides additional capacity to deter enemy actions and limit their opportunities to achieve their goals. Placing artillery in key positions, such as maritime straits, strategically located littorals, and archipelagos block these avenues to adversaries, while easing the demands on other services. Reducing the burden on naval and air forces to secure such areas frees them to conduct operations they are uniquely equipped to accomplish.[27] Additionally, artillery can be inserted, or maneuver themselves, into contested areas to attrite opponents and deny freedom of maneuver to adversaries located within their own A2/AD sanctuaries. Their inherently redundant fires capability reduces the risk of failure to operational commanders, while offering an alternative that can be more easily replaced than expensive and complex platforms in other domains.[28]

ADA provides additional capacity in making the force more resilient by increasing defenses against air and missile threats. This serves a multitude of purposes. One, it can reduce the expenditure of defensive munitions by air and naval assets in the fight for sea control. Ground assets can rearm their launchers in minutes, whereas ships and aircraft must return to base to rearm. This can increase the duration of assets on station. Two, as Figure 1 depicts, they can create their own area denial bubbles to facilitate safe areas for ISR, sustainment assets, or

[26] Lindsey, "Beyond Coast Artillery," 6.
[27] Lindsey, "Beyond Coast Artillery," 5.
[28] An M142 HIMARS cost $2-3 million apiece, as opposed to $1.7 billion for an Arleigh Burke-class DDG and $360 million for an Independence-class LCS: Marvel, "Exploring a Shore-to-Ship Fires Capability," 10.

merchant shipping to operate.[29] It also benefits USN ships, whose layered defense systems are less effective in littoral waters and, thus, they prefer open-ocean areas to maximize their utility.[30] Lastly, ADA can establish persistent defenses around critical infrastructures, such as airfields and port facilities, reducing their vulnerability and providing sustainers flexibility to decrease their distances from the operational area.

By introducing artillery to the battle for sea control, maritime commanders can leverage its strengths to overcome their own time, space, and force disadvantages. Properly employed, U.S. Army and USMC artillery is well suited for operations under these conditions. They can act as a resilient and persistent force with the distributed firepower to afford commanders more freedom of action in achieving their objectives. This enables artillery to serve as an asymmetric enabler to the maritime operational plan.

EMPLOYMENT CONCEPTS

"In war at sea, the operational objective is usually accomplished by obtaining control of a certain sea or ocean area, destroying or neutralizing a major part of the enemy fleet, or cutting off or defending the flow of maritime trade."
-Milan Vego, *Joint Operational Warfare*

US Army and USMC artillery's cross-domain ability to assist the JFMCC's operations depends upon the method in which employed. Exploiting their advantages against an opponent is critical for shaping the situation. Planning artillery's employment to maximize their capacity for mobility, dispersion, and persistence affords the JFMCC commander several options unique to each operation and each environment. The concepts listed here do not account for all the diplomatic concerns that may affect employment and are not meant to serve as a prescription, only to provide ideas for how these forces can be used in the joint operations phasing construct.

The shaping phase is one of the most important in a joint operation. Here joint forces

[29] Lindsey, "Beyond Coast Artillery," 5.
[30] Hughes, *Fleet Tactics and Coastal Combat*, 162.

conduct security activities to dissuade adversaries and assure allies.[31] During this phase, US Army and USMC units can focus on developing and integrating partner capabilities into the joint force. Allies across the world are contemplating ways to deal with A2/AD issues in their own backyard, places such as the Strait of Hormuz, Baltic and Black Seas.[32] With over 45 variations of anti-ship missiles being produced, many of our allies already possess the capability to deny sea control.[33] By training with these partners, US forces can develop relationships that will reduce friction and integration issues in a coalition built to address an aggressor's actions. This serves as a force multiplier, with host nation forces prepared and readily available to respond to potential issues. In the event of a crisis, such as an indication of an amphibious assault by an opponent, the JFC can quickly leverage these artillery forces as a deterrent. With both China and Russia building amphibious assault ships, this may prove crucial.[34] Figure 2 shows a hypothetical example in Taiwan.

As shaping operations start transitioning into deterrence, artillery's mobility enables its rapid deployment into a theater. As Figure 3 depicts, variations of US rocket launchers can be transported by C-130, C-17, or C-5, in addition to USMC surface connectors.[35] The JFC has the flexibility to surge them into a theater and maneuver them within it as needed. US Marines demonstrated this in 2016 by deploying HIMARS via C-130 to the Philippines and subsequently maneuvering it throughout the archipelago to conduct raids.[36] Artillery's mobility provides an effective flexible deterrent option to naval aggression that assures allies of our commitment to

[31] Joint Chiefs, *Joint Operations*, V-8.
[32] Simon, "A European Perspective on Anti-Access/Area Denial and the Third Offset Strategy."
[33] Kelley, "Employing Land-Based Anti-Ship Missiles," xii.
[34] Majumdar, "China's New Amphibious Assault Ship." Nagornykh, "Sea Trials of Russia's Large Amphibious Assault Ship."
[35] Marine Surface Connectors are a critical sea component to transport personnel, supplies, and equipment within the sea base and maneuver them from the sea base to objectives ashore.
[36] Simcock, "HIMARS," 24.

the region.[37]

Should deterrence fail and combat operations ensue, artillery forces can assist the JFC in transitioning phases to quickly seize the initiative and dominate key terrain. Artillery's decentralized nature enables the joint force to utilize them in numerous locations throughout the operational area. Additionally, their ease in changing munitions quickly, make them very versatile. For instance, Marines can conduct amphibious raids on targets in an adversary's kill chain, using standard artillery munitions to support raiding forces and strike enemy sensors, control nodes, and artillery.[38] Then they can quickly transition to an anti-ship mission to neutralize any enemy vessels responding to the attack. Bringing air defense assets forward can protect raiding parties from aerial counterattack and extend reach into enemy territory.[39] This method could also be used to seize intermediate staging bases, increasing operational reach of naval forces and reducing the time ships need to be offline for rearm and refit. The Army could replicate this technique in contiguous terrain along littorals, as found in Southeast Asia, Europe, and the Middle East.

The threat anti-ship artillery poses to an adversary's maritime traffic during phase two and three operations can present a dilemma to their leaders. Positioning artillery assets along critical narrow waterways can disrupt an opponent's merchant traffic. Conducting a blockade at choke points in the Asia-Pacific region could effectively stop all traffic in the western Pacific north of Australia.[40] In a theoretical conflict with China, this cumulative approach would deny 80% of its vital oil imports, a necessity to maintain its economy.[41] Estimates indicate conducting

[37] Joint Chiefs, JP 3-0, V-8.
[38] Clark, "Advancing Beyond the Beach," 22.
[39] Ibid., 19.
[40] Terrance Kelley, "Employing Land-Based Missiles," 8.
[41] Friedberg, *Beyond Air-Sea Battle*, 106.

a blockade in the Malaysian Archipelago would require at least 16 surface vessels, four replenishment ships, and relief ships in reserve, in addition to other supporting assets.[42] This taxing requirement represents almost a tenth of the USN's 275 ships.[43] As Figure 4 depicts, the need for surface vessels can be dramatically reduced by replacing ships with the durable persistence of artillery, to work in conjunction with smaller craft to intercept and board vessels. Figure 5 depicts a blockade of the East China Sea and Figure 6 shows a blockade of the entire region. Using artillery in this manner makes more forces available for offensive operations to increase the blockade's effects and overwhelm the enemy.

Artillery can also conduct sea denial during phase two and three operations. In this capacity, artillery can establish its own area-denial zones to thwart opponents' air and maritime traffic.[44] In keeping with the Pacific example, Figures 7-9 show that inserting batteries in nearby nations, Filipino-occupied Spratly Islands, and along China's first island chain from Korea to the Malay Peninsula would create mutually supporting, overlapping zones to turn large portions of the East and South China Seas into mutually denied space. In addition to blocking 85% of its international trade, this would contain Chinese air and naval forces while the US and allies determine a diplomatic resolution or build combat power to go on the offensive.[45] As Figures 10 and 11 depict, artillery can employ sea denial against Russia's Baltic and Black Sea Fleets should an escalating event occur with NATO allies.[46] As Figure 12 illustrates, this concept's versatility enables it to be an effective option against the Iranian A2/AD threat in the narrow Persian Gulf and Strait of Hormuz.[47]

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[42] Ibid., 108.
[43] U.S. Navy, Status of the U.S. Navy.
[44] Clark, "Advancing Beyond the Beach," 25.
[45] Friedberg, *Beyond Air-Sea Battle*, 117.
[46] Bugajski, "Black Sea Rising," 11; Osborn, "Russia Beefs Up Baltic Fleet."
[47] Gunzinger, "Outside-In," 51.

An advantage U.S. joint forces maintain over many other nations is its ability to operate along multiple lines of effort simultaneously, overwhelming an opponent's ability to cope.[48] Using artillery's capabilities in these roles can set the conditions for the JFMCC's success in obtaining sea control by increasing the complexity of the problem our adversaries face. Opponents will be compelled to either attempt to neutralize the artillery units, costing them force and time, or move their naval forces into open seas, increasing vulnerability to joint naval and air forces.

SUPPORTING JOINT OPERATIONAL FUNCTIONS

"We are accustomed to speak of naval strategy and military strategy as though they were distinct branches of knowledge which had no common ground. It is the theory of war which brings out their intimate relation. It reveals that embracing them both is a larger strategy which regards the fleet and army as one weapon, which coordinates their action, and indicates the lines on which each must move to realize the full power of both."
- Julian Corbett, *Some Principles of Maritime Strategy*

The effort to employ artillery units in support of the Navy's battle for sea control would require thorough integration and synchronization of the corresponding joint functions. The most crucial functions that would have to be developed for this operational concept to work are command and control, intelligence interoperability, and logistical support. Failing to implement a process to support these functions would severely limit the potential effectiveness of these assets and may induce an unacceptable level of risk to commanders.

A critical component to any operation is its command and control (C2) structure. In the role of commander over maritime operations, the JFMCC has authority over any forces assigned, attached, or made available for tasking.[49] This command relationship defines the priorities of effort for supporting forces. With this in mind, US Army artillery units supporting sea control should be assigned direct support roles to the JFMCC while remaining under operational control

[48] Joint Chiefs, *Joint Operational Access Concept*, 20.
[49] Joint Chiefs, *Cross-Domain Planning Guide*, 44.

of the Joint Force Land Component Commander (JFLCC).[50] In this regard, the US Army artillery units would replicate the doctrinal relationship the Army Air and Missile Defense Commander (AAMDC) employs as a subordinate to the Area Air Defense Commander.[51] This allows the artillery unit commander and his liaison team to advise and assist the JFMCC staff in developing an integrated plan for sea control. Additionally, it allows the artillery unit staff to recommend an apportionment of its fires between targets supporting land and maritime components.[52] This best enables the artillery force commander to allocate his assets in support of the priorities assigned by the JFMCC, while still allowing some flexibility to provide fire support to the JFLCC. USMC artillery, on the other hand, can maintain its customary relationship to the JFMCC. However, if the JFC transitions operational control of USMC assets to the JFLCC, it should integrate its fires capabilities into the Artillery Forces Liaison Team to ensure continuity of effort.

Another aspect to enabling C2 is the seamless transmission of data ship-to-shore and vice versa. Similar to friendly forces, the ability of mobile enemy anti-ship missile launchers to "shoot and scoot" and camouflage their location requires US forces to collect timely and precise targeting information.[53] To achieve this, all targeting data should be integrated into an interoperable automated fire control system.[54] Utilizing a common system enables leaders at each echelon to develop a better understanding of the situation and quickly determine an appropriate response. An artillery battery may service a target detected by a ship, thereby

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[50] JP 1 defines direct support as a mission requiring a force to support another specific force and authorizing it to answer directly to the supported force's request for assistance. This is the same relationship generally employed of the Army Air Defense Commander, OPCON to the JFLCC, but in direct support of the JFACC's Area Air Defense Commander: Joint Chiefs, *Countering Air and Missile Threats*, II-6.
[51] See JP 3-01, p. II-4 for the Army Air and Defense Command's role to the Area Air Defense Commander and JP 3-30, p. F-3 outlines the roles of the AAMDC Team.
[52] For an example in the existing air apportionment decision, refer to JP 3-30, p. III-22.
[53] Gunzinger, "Outside-In," 65.
[54] Marvel, "Exploring Shore-to-ship Fires," 10.

preserving the ship's munitions and extending its time on station. The joint air and missile defense community is developing this capability for itself with the creation of the Integrated Air and Missile Defense Battle Command System.[55] Currently, incorporation of C2 is spread across multiple systems throughout the joint force. Prospects appear promising to simplify the number of interfaces and improve their functionality, to include artillery fire control assets. Developing a common system reduces latency, provides a better common operating picture and redundant coverage of threats to all elements. Potential targets of a salvo could quickly take defensive actions while a second element, land or sea based, conducts counterfire on the shooters. This would dramatically increase responsiveness and survivability in a fight for sea control.

Another essential aspect to support these functions is the integration and interoperability of all intelligence, surveillance, and reconnaissance (ISR) information. As described by the JOAC manual, "the increased lethality, precision, and accuracy of A2/AD systems requires the ability of the joint force to collect, fuse, and share accurate, timely, and detailed intelligence across all domains."[56] In particular, information from reconnaissance and surveillance will be vital for access operations. USN warships depend on finding the enemy and firing effectively first.[57] To do this, they are equipped with capable arrays of sensors networked through multiple air, surface, and underwater platforms. Conversely, due to longer emplacement times, the effects of terrain-masking, and their smaller size, mobile ground sensors tend to be less effective at capturing data. For artillery units to effectively neutralize enemy forces, batteries will depend on full integration into the JFMCC's ISR network to receive the accurate and timely information

[55] Integrated Air and Missile Defense Battle Command System, Northrop Grumman; Freedberg, "Army Races to Rebuild Short-Range Air Defense."
[56] Joint Chiefs, *Joint Operational Access Concept*, 29.
[57] Hughes, *Fleet Tactics and Coastal Combat*, 162.

they require.[58]

Sustainment is another important aspect to consider for artillery operations supporting the JFMCC. Army doctrine states that its expeditionary forces can be deployed anywhere in the world and be ready to fight immediately.[59] Rapid deployment of artillery as a deterrent will likely result in these formations being employed in austere environments with limited supporting services. In such a scenario, they will initially depend on a combination of host nation support and prepositioned supplies. Success in sustaining these initial entry operations depends on planning and forethought by joint staff and host nation allies.

As operations continue, formations will begin to exhaust on hand supplies and become attrited. These units will likely require the assistance of joint force sustainment to maintain their tempo until follow-on forces can establish a lodgment.[60] When artillery units are put ashore at positions without host nation support, preposition stocks, or at isolated locations to support the fight for sea control, the JFMCC will likely need to plan for afloat forward-staging bases and other lift assets to provide the interim sustainment necessary until resources that are more robust can be allocated.[61]

To successfully employ artillery units in support of obtaining sea control, the operational functions must be coordinated. By establishing an effective command and control structure, integrating intelligence and targeting data, and planning for sustainment, the JFMCC can optimize the asymmetric effects artillery systems have on adversarial forces. Staffs and subordinates synchronizing these functions permit the commander to coordinate attacks along multiple lines of operation, thereby massing his forces in time and space. It is through these

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[58] Marvel, "Exploring Shore-to-ship Fires," 10.
[59] U.S. Army, *Unified Land Operations*, 1-10.
[60] Joint Chiefs, *Joint Concept for Entry Operations*, 17.
[61] Wonson, "Embrace Afloat Forward Staging," 12; Joint Chiefs, *Joint Operational Access Concept*, 32.

coordinated efforts that he can overwhelm the enemy to achieve maritime superiority and obtain access to denied areas.

COUNTERARGUMENT

"It is critical that there be no disconnect or mismatch between the ends and the means; otherwise, the ultimate objectives of a campaign or operation might not be attained."
-Milan Vego, *Joint Operational Warfare*

Some critics argue that employing land forces to obtain sea control is unrealistic. Without the ability to maneuver on the domain, they will be incredibly challenged to gain any form of superiority on it. To support their claim, they point to Japan's failed area denial strategy during WWII. To secure the territory it captured, the Japanese built "unsinkable carriers" on strategically located islands along the perimeter to create impenetrable zones of defense. From these locations, they envisioned projecting forces to attrite and ultimately destroy invading US forces.[62] This strategy failed because it permitted the USN to choose which island fortresses it needed to attain and which ones it could isolate, destroy, or bypass. In much the same way, opposing navies today can choose which positions they must allocate resources to secure and which ones they can simply avoid.

Additionally, critics question the feasibility of deploying land forces into the operational area and sustaining operations in a contested A2/AD environment. As adversaries continue to develop sophisticated anti-access networks and long-range targeting capabilities, they can put critical and irreplaceable assets, such as ships and aircraft, at unacceptable risk from far greater distances than before.[63] This could result in land forces, deployed as part of a deterrent option, being subsequently isolated by an adversary denying access via air, water, and land once a conflict erupts. Such a scenario would present a substantial dilemma for the JFC. The defeat and

[62] Baer, *One Hundred Years of Sea Power*, 132.
[63] Work, "Hitting the Beach in the 21st Century."

capture of isolated forces on the Philippines during WWII serves as a somber reminder of this threat.

Some details should be considered in response to these criticisms. During WWII, Japan's defensive plan failed, in part, because the size of its empire had exceeded its military's span of control. At its zenith, the Japanese oceanic perimeter stretched over 14,200 miles.[64] Considering the limitations of technology available during that time, the Imperial Japanese Navy did not have an adequate number of personnel and equipment to secure it all. What makes an A2/AD strategy different today is the improvement in weapons, sensors, and communication technology. These developments have enabled new means for employing a maritime denial strategy without fielding a large, modern navy or air force.[65] One needs not look any further than Iran to prove this point. Iran realized after the Tanker War that it lacked the means to pose a credible symmetric naval threat to the USN.[66] Instead, using little more than speedboats and land-based missiles, Iranians have exploited their advantageous geographic position to create a challenging A2/AD problem.[67]

As detailed in the Joint Concept for Entry Operations, initial entry forces must have the capacity to sustain themselves internally for a predetermined amount of time.[68] The key to extending the time before that force reaches its culminating point is its relationship with allies. Forethought in establishing good partnerships with allies, using interoperable equipment, and prepositioning essential supplies will prove critical to sustaining combat operations. Additionally, entry force operations will have to be a joint effort, with services leveraging

[64] James, *Makers of Modern Strategy*, 717.
[65] Biddle, "Future Warfare in the Western Pacific," 19.
[66] Gunzinger, "Outside-In," 23.
[67] Ibid., 41.
[68] Joint Chiefs, *Joint Concept for Entry Operations*, 16.

capabilities across all domains to suppress the enemy's battle network. The initial phase of any entry operation will require friendly forces exploiting an adversary's vulnerabilities to achieve superiority in the objective area.[69] Infiltrating the opponent's A2/AD bubble with artillery that can subsequently deny the area's use to the adversary and open its access for allied exploitation can present a crucial opportunity for joint forces to establish a lodgment and extend its operational reach. With the relative value that these asymmetric assets offer, compared to the cost of a single platform in another domain, it is a capability worth considering.

CONCLUSIONS

"The emphasis on cross-domain synergy that is central to this concept applies first and foremost to fires."
-Joint Operational Access Concept

As President Dwight D. Eisenhower proclaimed over half of a century ago, "Separate ground, sea, and air warfare is gone forever. If ever again we should be involved in war, we will fight it in all elements, with all services, as one single concentrated effort."[70] In this era of fiscal constraints and A2/AD threats to air and maritime forces, we must integrate capabilities from across all domains to project military forces, overwhelm opponents, and achieve freedom of action. US Army and USMC artillery offer one such capability. It is a resilient and persistent force with the distributed firepower to achieve freedom of action within the operational environment.

Mobile launchers have the advantage of surviving by hiding among a complex background of terrain, trees, and urban features.[71] They can rapidly deploy to assure allies or deter opponents. They have the ability to disperse across the operational area, while providing synchronized, massed fires. They provide an enduring capability with lower sustainment needs.

[69] Joint Chiefs, *Joint Concept for Entry Operations*, 20.
[70] Dempsey, "The Future of Joint Operations."
[71] Biddle, "Future Warfare in the Western Pacific," 20.

The presence of artillery can present a dilemma to adversaries. These relatively low-cost assets provide a more complex operational environment that opponents must address. They require an enemy to expend resources to locate and neutralize them. As CAPT Wayne Hughes (Ret.) stated in his book, "For littoral operations, it is no longer possible to define a fleet merely as a set of warships, because land-based systems play a prominent part."[72] When part of a synchronized campaign working across multiple domains, artillery can provide an asymmetric advantage that an opponent cannot afford to discount.

RECOMMENDATIONS

Employing artillery in this manner will require modifications to current capabilities and structures. Recommendations for proceeding with this cross-domain approach include:

- Continued development and fielding of munitions to be utilized by MLRS and HIMAR platforms capable of dual purpose use, striking moving targets on land or at sea, in a contested electromagnetic environment.
- Continue to increase the capability and number of short-range, ADA units to meet the demands of the joint force currently abroad and needed in implementing this concept.
- Much like the integration and interoperability of Air Missile Defense assets to a central battle net, land; air; and naval target acquisition and fire control systems should be integrated and interoperable on a common battle net.
- Use simulations and wargames to test operational concepts, determine requirements for expeditionary packages, and develop potential courses of action for use in crisis response.
- Negotiate allied sustainment provisions and prepositioning of supplies to support identified potential courses of action.

[72] Hughes, Fleet Tactics, 168.

- Leverage knowledge of allies that currently possess mobile anti-ship missile launchers.
- Design the joint force C2 construct to employ these assets successfully. Flexibility should be inherent. Much like ground-based air defense assets, artillery unit commanders should be able to support both the maritime commanders and land component commanders.

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APPENDIX

Figure 1
Artillery units' capability to create mobile area denial zones to facilitate friendly and neutral operations. *IFPC is the ADA's Indirect Fire Protection Capability system. It is designed to defend against aircraft, missiles, and UAVs.[73]

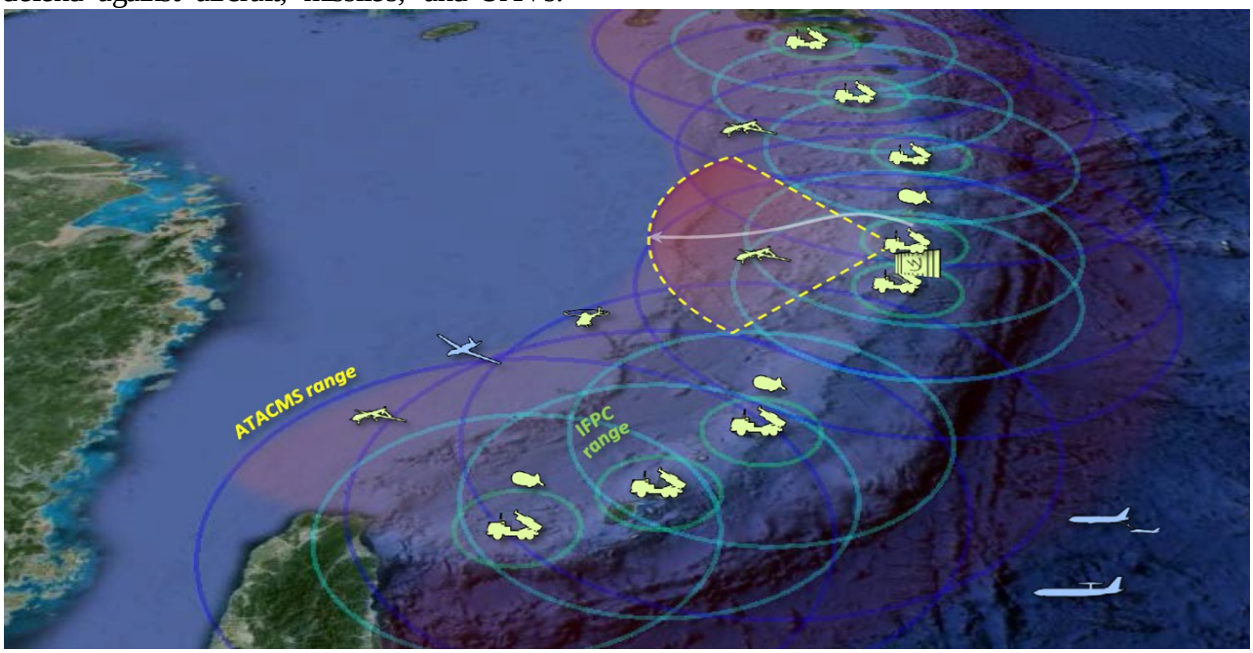
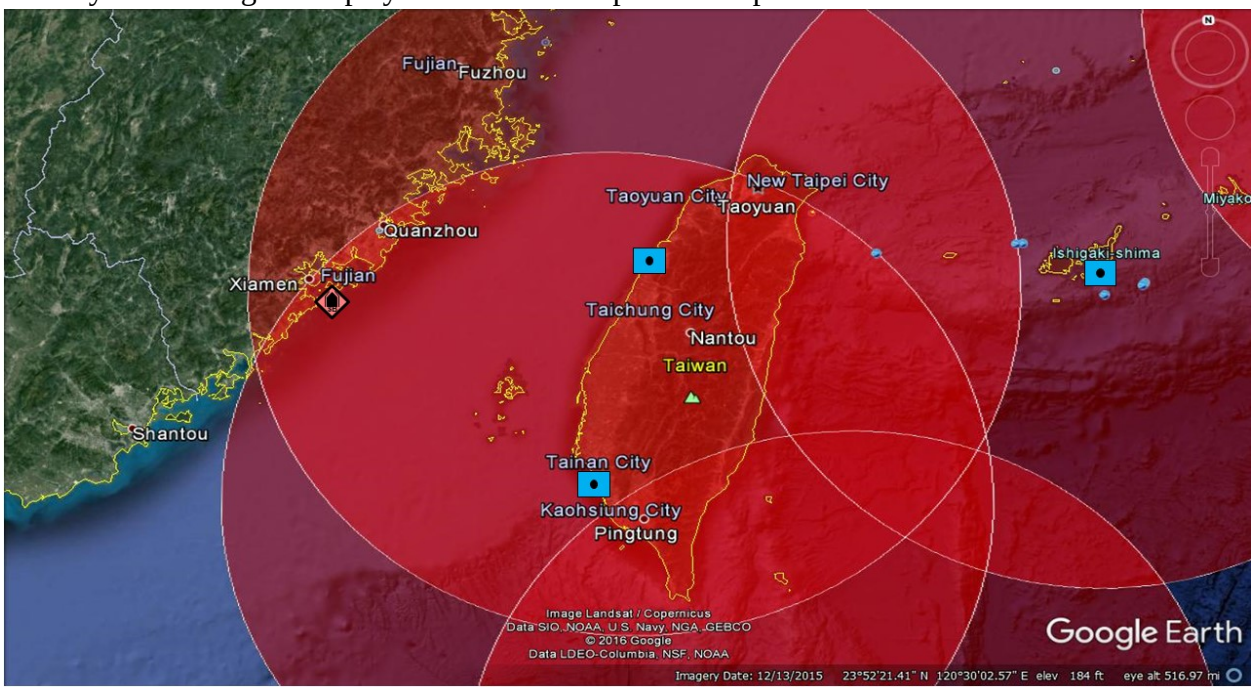


Figure 2
Artillery units' range if employed in Taiwan to prevent amphibious invasion.



[73] Photo source: Clark, "Advancing Beyond the Beach," 26.

Figure 3
HIMARS deployed via C-130 in a training exercise.

Figure 4
Artillery's capability to blockade access to the South China Sea.

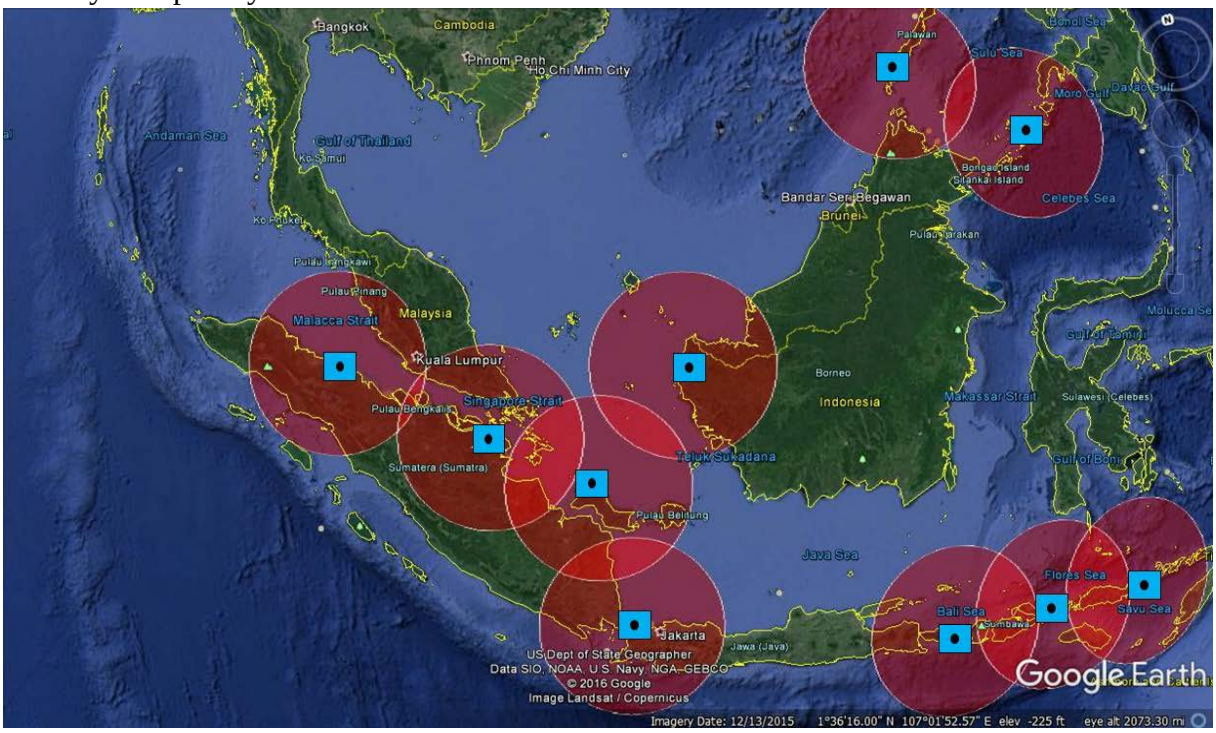


Figure 5
Artillery unit's capability to blockade access to the East China Sea from allied nations.

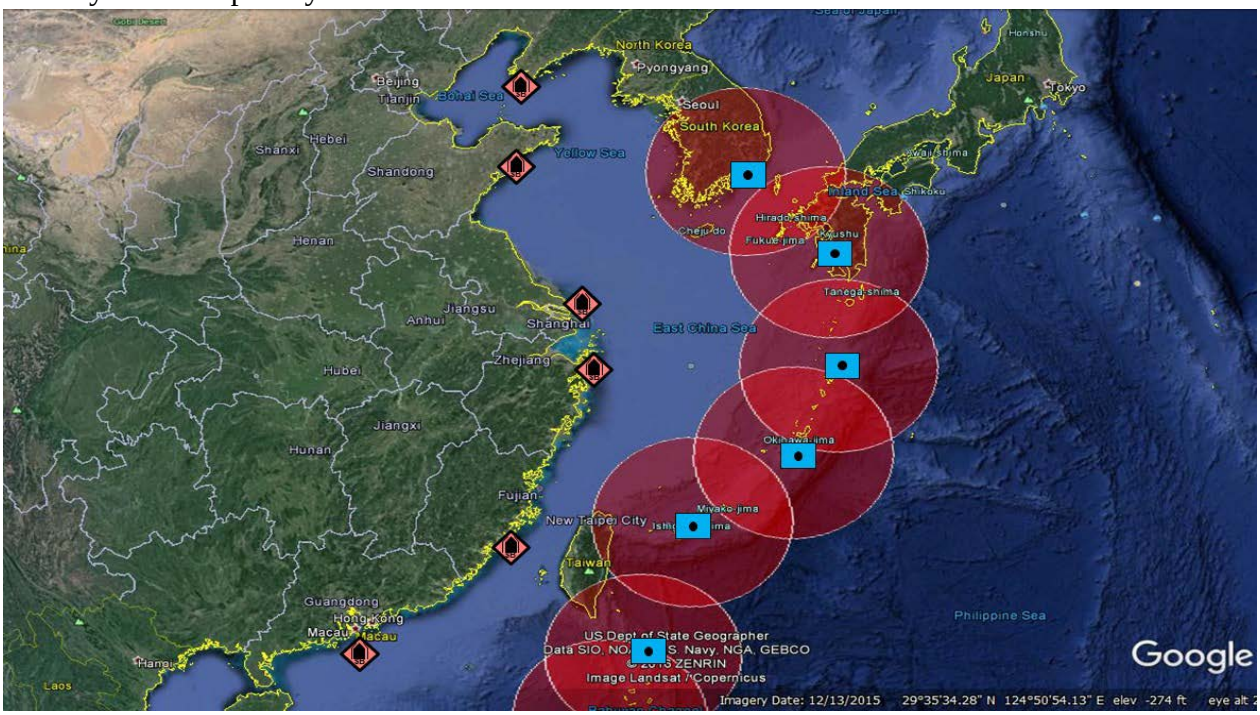


Figure 6
Isolating Asian shipping from the Western Pacific and Indian Oceans with artillery from key locations throughout the region.

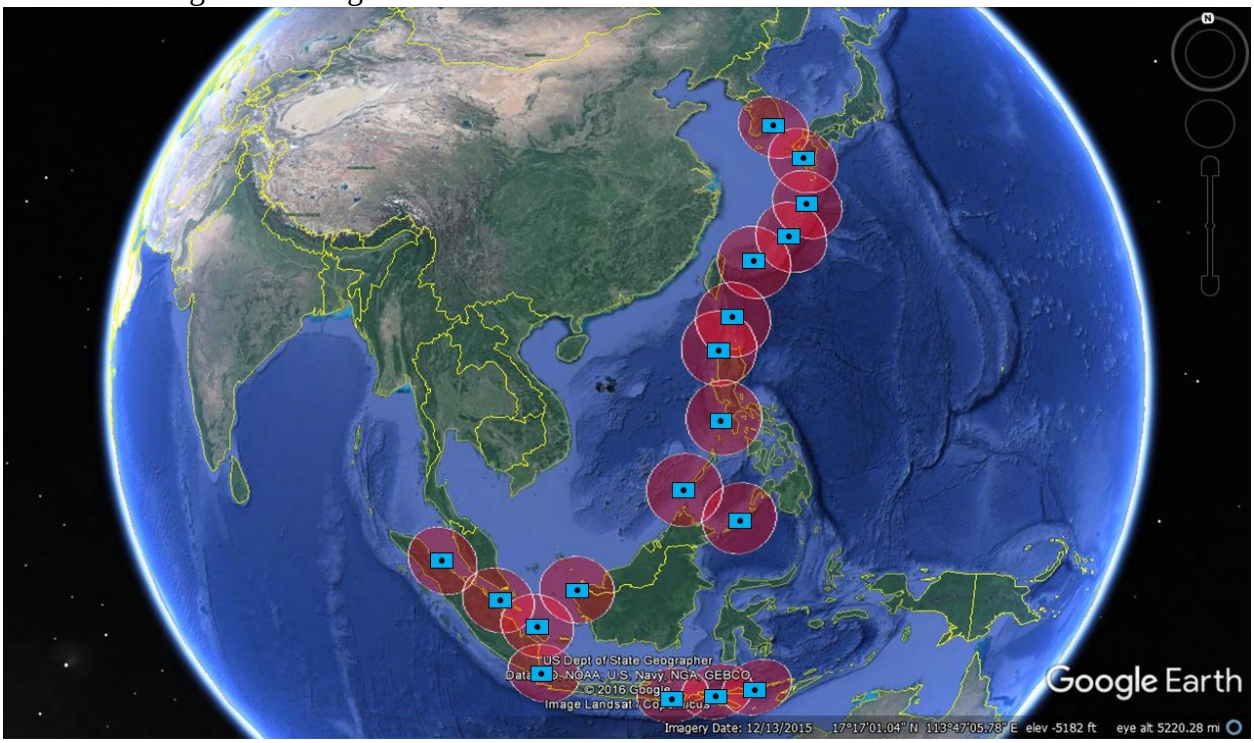


Figure 7
Inserting artillery along littoral areas of nearby nations, along the first island chain, and on Spratly Islands occupied by the Philippines can limit adversarial freedom of maneuver in the East and South China Seas.

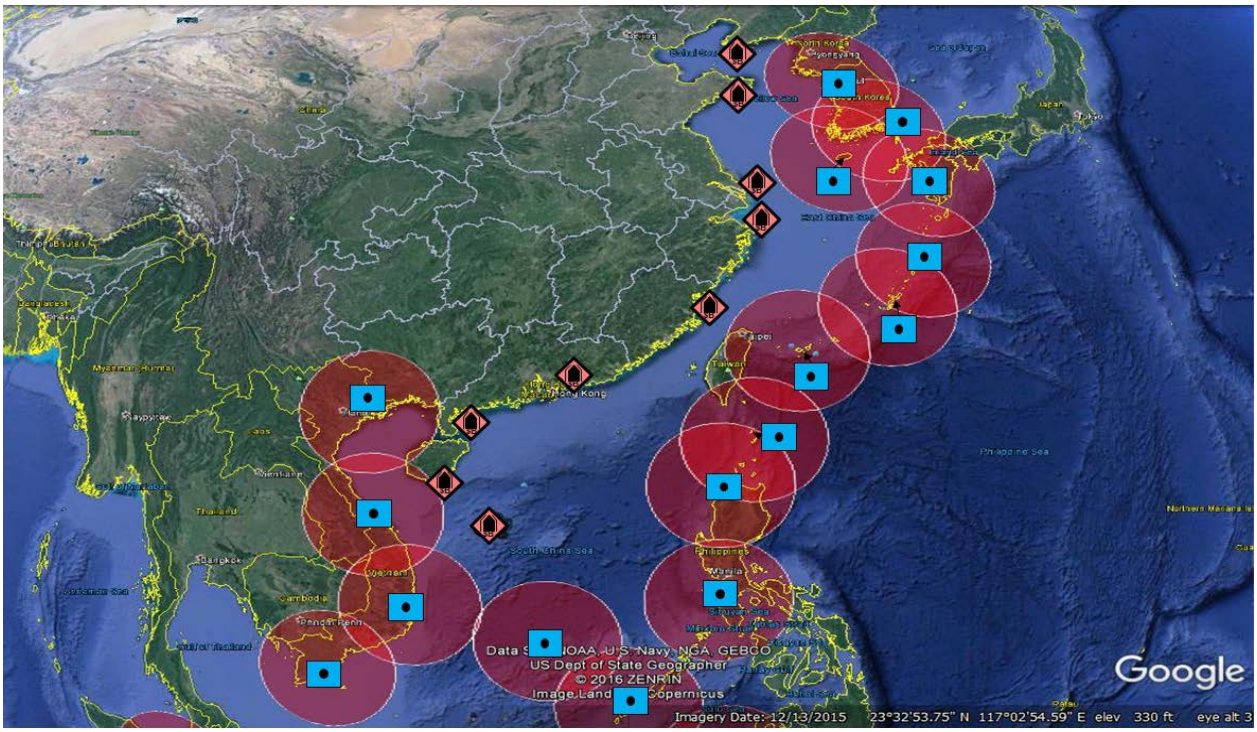


Figure 8
Artillery units' limiting adversarial freedom of navigation within littoral areas of partnered nations in East China and Yellow Seas.

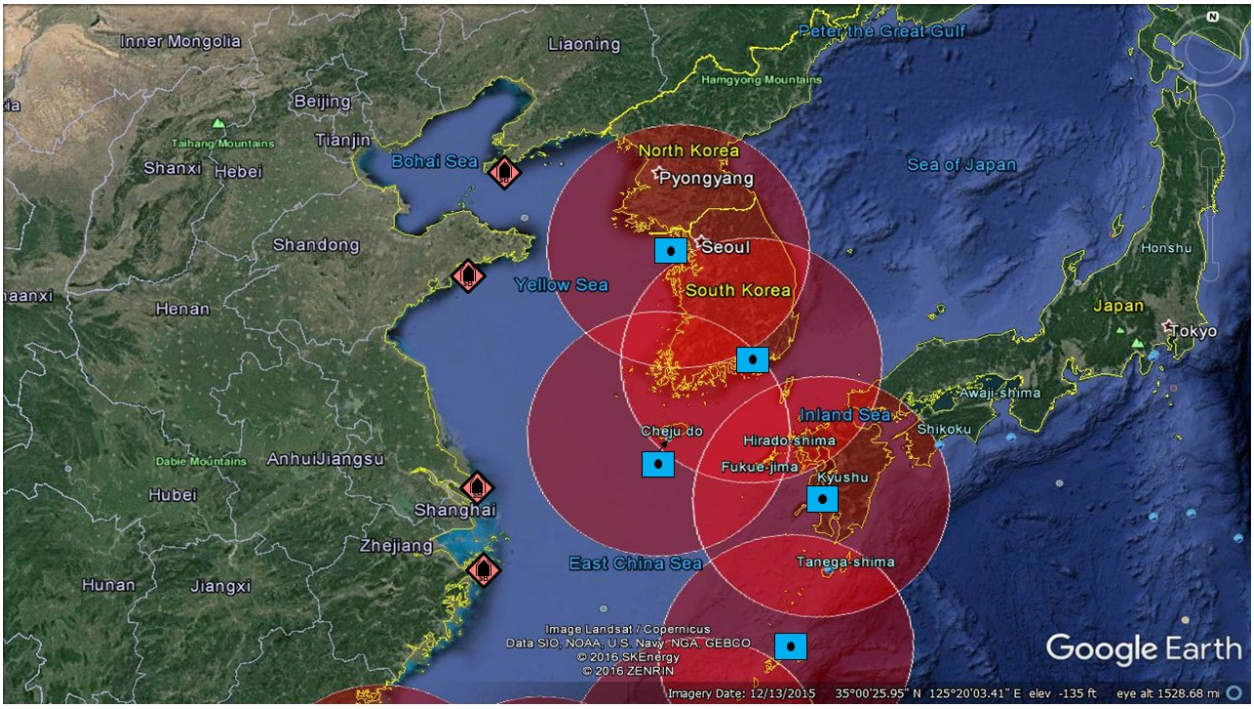


Figure 9
Artillery units' limiting adversarial freedom of navigation within littoral areas and Spratly Islands occupied by the Philippines in the South China Sea.

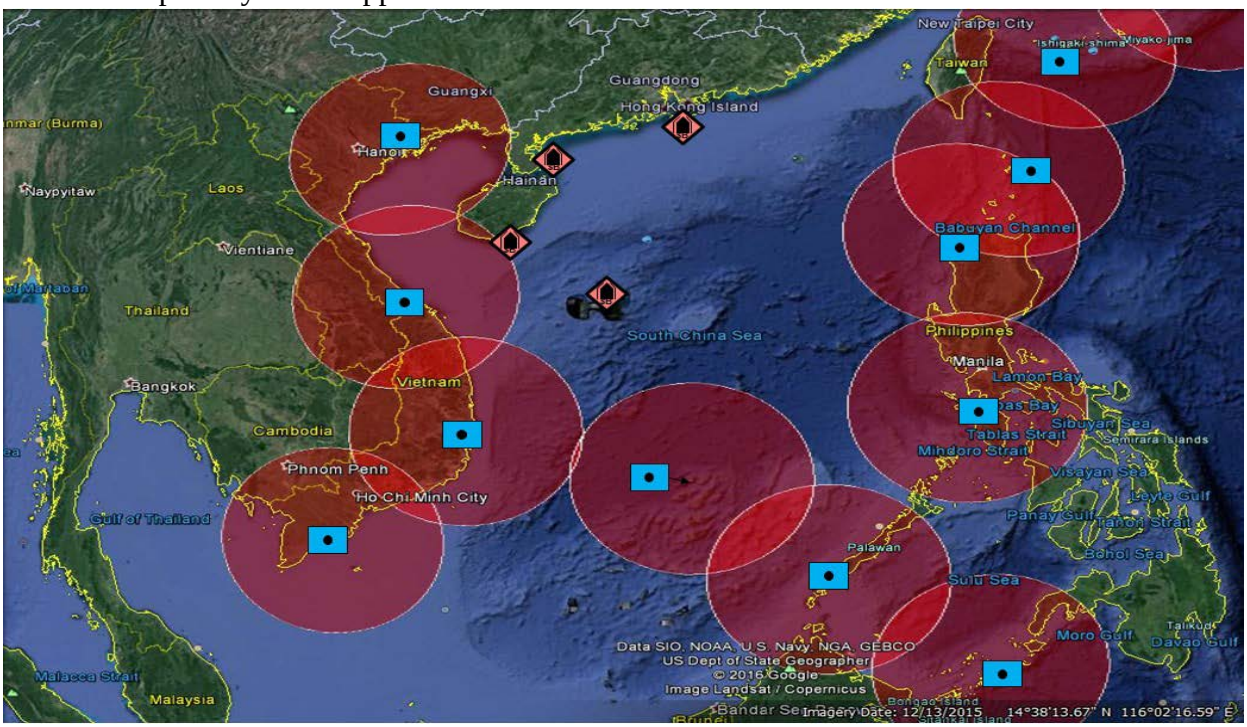


Figure 10
Artillery units' capability to conduct sea denial against the Russian Baltic Fleet at Baltiysk, Kaliningrad and Kronstadt, St. Petersburg from NATO allied countries.

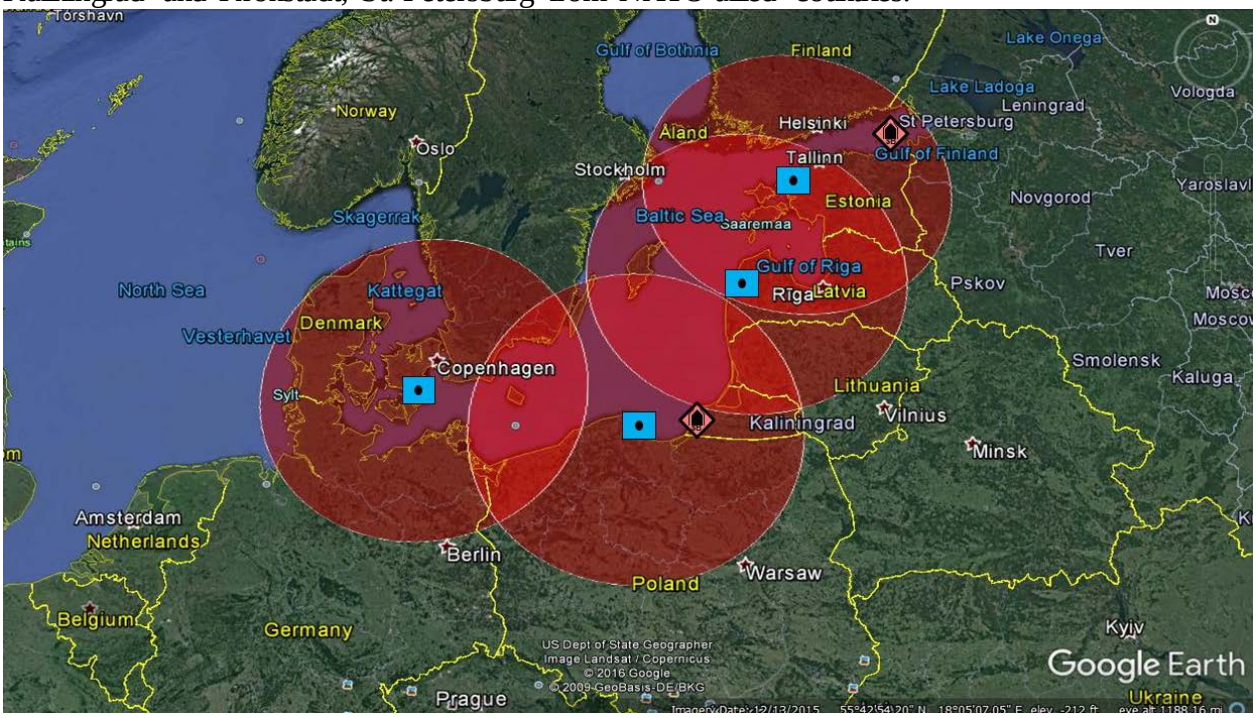


Figure 11
Artillery units' capability to conduct sea denial against the Russian Black Sea Fleet at Novorossiysk and Sevastopol from NATO allied countries.

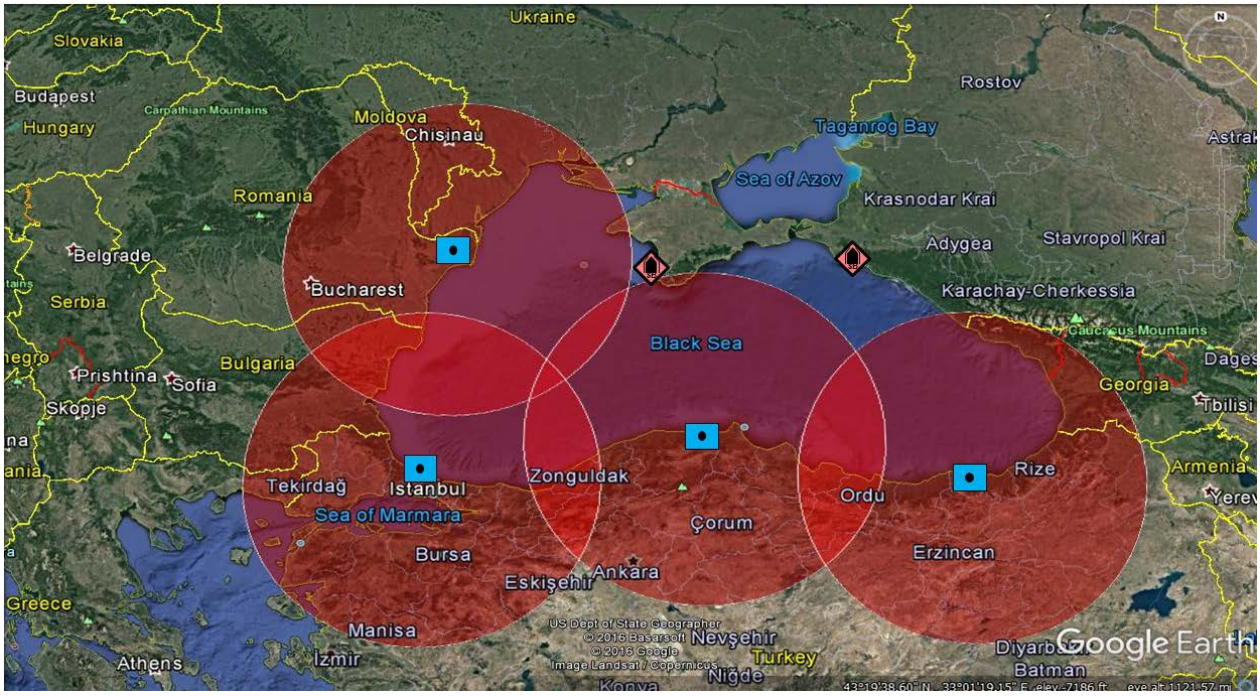


Figure 12
Artillery units' capability to shape the operational environment in the Persian Gulf by providing persistent air defense and targeting Iranian mobile anti-ship missile launching platforms from friendly and allied nations.